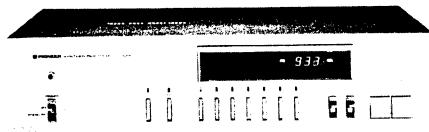


Service Manual



SYNTHEZIZED STEREO TUNER

TX-710 /HE

MODEL TX-710 COMES IN THREE VERSIONS DISTINGUISHED AS FOLLOWS:

| Type | Voltage | Remarks |
|------|---|----------------------|
| HE | AC 220 and 240V (Switchable) | Europe model |
| S | AC 110V, 120V, 220V and 240V (Switchable) | General export model |
| S/G | AC 110V, 120V, 220V and 240V (Switchable) | U.S. Military model |

- This service manual is applicable to the HE type. When repairing the S and S/G type, please see the additional service manual (ART-547).

CONTENTS

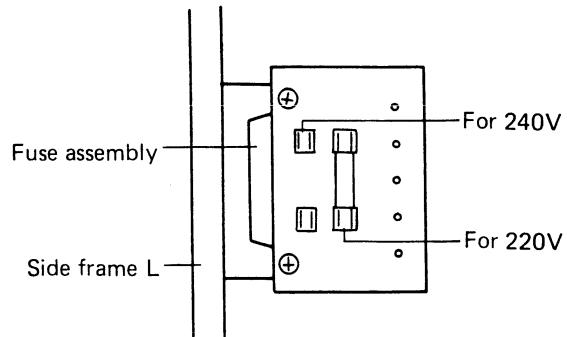
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LINE VOLTAGE SELECTION

Line voltage can be changed as follows:

1. Disconnect the AC power cord.
2. Remove the bonnet case.
3. Take out the fuse from the P.C. board.
4. Re-install the fuse in the correct voltage indication.
5. Stick the line voltage label on the rear panel.

| Description | Part No. |
|-------------|----------|
| 220V label | AAX-193 |
| 240V label | AAX-192 |



1. SPECIFICATIONS

FM Tuner Section

| | |
|--|--|
| Usable Sensitivity | 10.8dBf (1.9 μ V) |
| Sensitivity (DIN) | |
| MONO | 1.5 μ V |
| STEREO | 50 μ V |
| 50dB Quieting Sensitivity | |
| MONO | 16dBf (3.5 μ V) |
| STEREO | 38dBf (44 μ V) |
| Signal-to-Noise Ratio (at 85dBf) | |
| MONO | 78dB |
| STEREO | 75dB |
| Signal-to-Noise Ratio (DIN) | |
| MONO | 71dB |
| STEREO | 62dB |
| Distortion (at 65dBf) | |
| MONO | 1kHz; 0.08% |
| STEREO | 1kHz; 0.15% |
| Distortion (DIN) | |
| MONO | 1kHz; 0.08% |
| STEREO | 1kHz; 0.15% |
| Capture Ratio | 1dB |
| Alternate Channel Selectivity (400kHz) | 60dB |
| Stereo Separation | 1kHz; 40dB |
| Frequency Response | 20Hz to 15kHz ^{+0.2} ₋₁ dB |
| Spurious Response Ratio | 65dB |
| Image Response Ratio | 45dB |
| IF Response Ratio | 80dB |
| AM Suppression Ratio | 55dB |
| Antenna Input | 300 ohms balanced, 75 ohms unbalanced |

AM Tuner Section

| | |
|---------------------------------|---------------------------|
| Sensitivity | |
| IHF ferrite antenna | 300 μ V/m |
| IHF external antenna | 30 μ V |
| Selectivity | 25dB |
| Signal to Noise Ratio | 50dB |
| Image Response Ratio | 40dB |
| IF Response Ratio | 70dB |
| Antenna | Ferrite loopstick antenna |

Audio Section

| | |
|-------------------------|-------|
| Output (Level) | |
| FM (100% MOD) | 650mV |
| AM (30% MOD) | 150mV |

Miscellaneous

| | |
|------------------------------------|---|
| Power Requirements | a.c. 220V, 50/60Hz |
| Power Consumption | 16W |
| Dimensions | 420(W) x 94(H) x 270(D)mm 16-9/16(W) x 3-11/16(H) x 10-5/8(D) in |
| Weight (Without Package) | 3.3kg (7lb 4oz) |

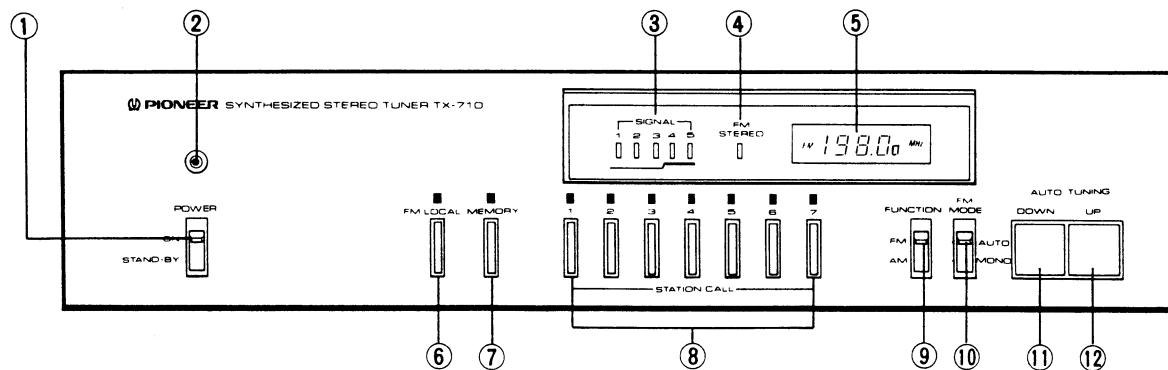
Furnished Parts

| | |
|----------------------------------|---|
| FM T-type antenna | 1 |
| Operating Instructions | 1 |

NOTE:

Specifications and the design subject to possible modification without notice due to improvements.

2. FRONT PANEL FACILITIES



① POWER SWITCH

When this switch is set to the ON position, power is supplied to the tuner's main circuits. The unit's power switch is geared to selecting the transformer's secondary and so even at the STAND-BY position, the unit's circuitry will work as long as the power cord is connected to the power outlet. For this reason, the programmed broadcasting stations will not be erased.

Disconnect the power cord from the power outlet when you do not plan to use the unit for a long period of time. When it has been disconnected, the broadcasting stations remain programmed for about 3 days.

② POWER INDICATOR

This comes on as soon as the tuner's power switch is set to ON.

③ SIGNAL INDICATORS

These indicators "1" through "5" light up in accordance with the strength of the signal.

④ FM STEREO INDICATOR

This indicator lights up when the tuner is receiving a stereo program.

⑤ FREQUENCY DISPLAY

This indicates the tuned frequency.

⑥ FM LOCAL SWITCH

This selects the stop level with auto tuning.

When this switch is depressed to the LOCAL position, a broadcasting station with a relatively strong input level is chosen when the tuning switch is depressed and the frequency band is scanned, and the scanning operation stops.

When the switch is set to the OFF position (the indicator goes off), frequency scanning stops even with broadcasting stations with a weak input level, and the station's program can be received.

When the power switch is at the ON position, the FM LOCAL switch will always return to the OFF position.

⑦ MEMORY SWITCH

This is depressed when presetting a broadcasting station into one of the station call switches. For presetting, depress the memory switch and then depress the station call switch which will be used for presetting the station while the indicator above the memory switch remains lighted (about 5 seconds).

⑧ STATION CALL SWITCHES

These are depressed to call out preset broadcasting stations and to preset the stations.

To call out a station, first set the desired frequency band using the function switch and then depress the desired switch.

⑨ FUNCTION SWITCH

This switch is used to select the type of broadcasting waves.

FM . . . For reception of FM broadcasting.
AM . . . For reception of AM broadcasting.

⑩ FM MODE SWITCH

This is used to select the FM reception mode.

AUTO . . When an FM broadcast is being received in stereo, the unit will automatically set reception to mono in the event of an FM mono broadcast.

MONO . . If there is a great deal of noise or if the broadcasting station signals are weak during reception at the AUTO position, set the switch to this position.

⑪ AUTO TUNING DOWN SWITCH

When this switch is depressed lightly, the reception frequency automatically scans the frequencies below that on the frequency display. As soon as a station is received, the frequency display stops and the optimum tuned state is held by the AFC circuit.

NOTE:

If the switch is kept in the depressed position, scanning continues without automatically stopping even when there are broadcasting stations. When the lower limit of the frequency band is reached, scanning jumps to the highest frequency and then proceeds again down the band.

⑫ AUTO TUNING UP SWITCH

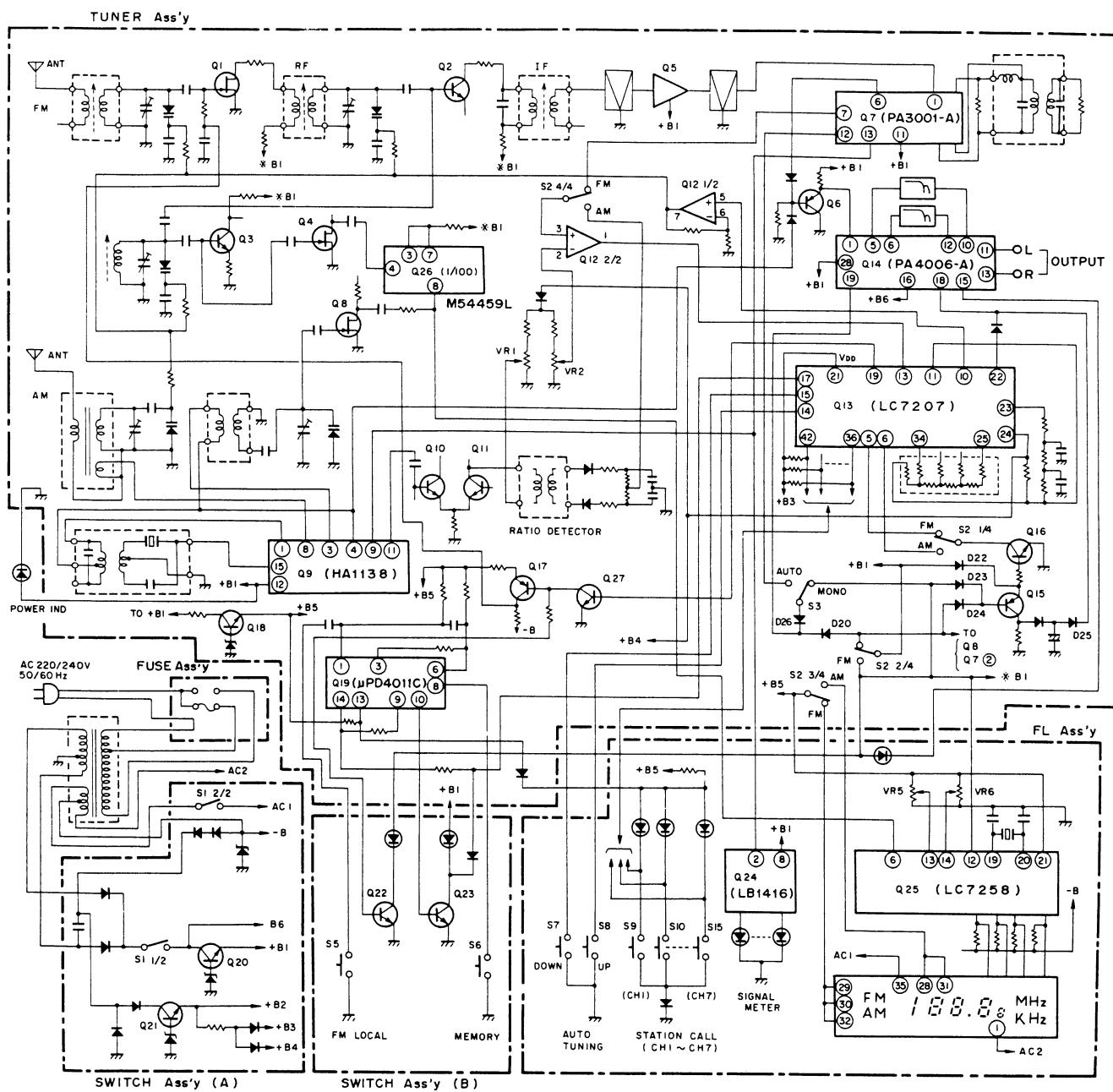
When this switch is depressed lightly, the reception frequency automatically scans the frequencies above that on the frequency display. As soon as a station is received, the frequency display stops and the optimum tuned state is held by the AFC circuit.

NOTE:

If the switch is kept in the depressed position, scanning continues without automatically stopping even when there are broadcasting stations. When the upper limit of the frequency band is reached, scanning jumps to the lowest frequency and then proceeds again up the band.

AFC: AFC stands for Automatic Frequency Control, and it is a circuit which is designed to prevent deviations in the tuning point brought about by fluctuations in the ambient temperature.

3. BLOCK DIAGRAM



4. CIRCUIT DESCRIPTIONS

The TX-710 tuner stage features an auto-tuning mechanism incorporating variable capacitor diodes (vari-caps) and voltage synthesizer IC circuitry. In addition, it is also possible to preset up to 7 different broadcasting stations in both the AM and FM bands.

FM TUNER

Front-end

The FM front-end in the TX-710 consists of a J-FET equipped single-stage RF amplifier and a variable capacitor diode type tuning capacitor (equivalent to a normal 3-ganged tuning capacitor). The basic operation involves the conversion of digital codes to analog voltages by a D-A converter made of ladder resistor and an LSI-incorporated 10-bit up/down counter, and applying this voltage to the variable capacitor.

IF Amplifier and Detector

The FM IF amplifier includes 2 ceramic filters, a differential amplifier equipped IC (HA1201), and an FM IF system IC (PA3001-A). In addition to filter loss compensation, HA1201 also serves as a limiter. PA3001-A contains the IF amplifier, limiter, and detector (quadrature detector) stages.

FM Stereo Decoder

The FM stereo decoder is incorporated in the PLL MPX IC (PA4006-A) which has been designed to include the functions formerly handled by PA1001-A (FM stereo decoder IC) and PA1002-A (AF muting IC). This FM decoder features the "direct through & chopper system" for improved S/N ratio and reduced distortion.

AM TUNER

The AM tuner stage features an IC (HA1138) incorporating the RF amplifier, mixer, local OSC, IF amplifier and detector, AGC circuits. The tuning circuit consists of variable capacitor diodes equivalent to a conventional 2-ganged tuning capacitor. As in the FM tuner, a voltage obtained

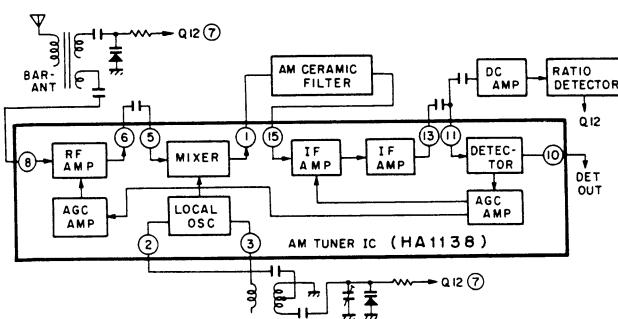


Fig. 4-1 AM tuner block diagram

by D-A conversion (ladder resistor and LC7207 LSI) is applied to this variable capacitor diodes. In addition, the S-curve involved in fine tuning by the auto tuning system is detected by a special ratio detector circuit.

VOLTAGE SYNTHESIZER

The "heart" of the auto-tuning mechanism is served by the LC7207 LSI which contains the AFC circuit (where the S-curve characteristics are employed for fine tuning purposes) in addition to the preset, auto-search tuning, auto-stop, and last-memory functions for up to 7 separate broadcasting stations in each of the FM and AM bands.

COUNTER

During FM mode output signals from the local oscillator are passed via an FET buffer amplifier, divided by a 1/100 prescalar (M54459L), and applied to the counter IC (LC7258).

During AM mode local oscillator output signals are passed via another FET buffer amplifier, but are then applied directly to the counter IC.

The input signal is compared with a reference signal (4MHz) generated by an external oscillator (i.e. not incorporated in the LC7258 LSI), resulting in the tuned frequency being displayed in 50kHz steps during FM mode, and 1kHz steps during AM mode.

FLUORESCENT TUBE INDICATOR

The fluorescent tube indicator employed here is of the static drive type. In addition to tuned frequency, this display also includes "MHz" during FM mode, and "kHz" during AM reception.

FM AUTO-STOP LEVEL CONTROL STAGE (FM LOCAL SWITCH)

During FM auto-search tuning mode, weak distant broadcasting stations are ignored. Only stations with an antenna input level above a certain fixed value will be tuned. However, if the FM LOCAL switch is pressed (ON position) and the corresponding indicator LED turned on, the front-end gain is reduced by the LC7207 LSI. Then following auto-stop, the front-end gain is increased again back to the former level to ensure high sensitivity reception of the tuned broadcasting station. This function is turned on and off alternately by a flip-flop circuit in conjunction with the μ PD4011C IC every time the FM LOCAL switch is pressed. Note, however, that it is always switched to the OFF position when the power supply is turned on.

POWER SUPPLY BACK-UP CIRCUIT

With the power switch in the TX-710 connected to the secondary coil of the power transformer, all frequencies stored in the STATION CALL channels, and also the frequency of the last-used channel, will be stored in the LC7207 LSI when the power switch is left in the STAND-BY position. And even if the power cord is unplugged from the AC mains socket (thereby cutting the power to the primary coil) the LSI memory will be retained for at least 3 days by charge stored in a capacitor in the LSI power supply circuit.

LSI (LC7207) Terminals and Functions

The functions of the various terminals of the voltage synthesizer (LC7207) are described in brief below.

- Pin 1 (CR1)

An oscillator circuit is formed by connecting this terminal to an external RC time constant circuit. The signals generated serve as the basic clock signals for the LSI.

- Pin 2 (CR2)

A timer circuit is formed by connecting this terminal to an external RC time constant circuit. This timer is used to determine the pulse width of the MUTE output signals employed during band switching.

- Pin 3 (BUC)

When a low level signal is applied to this terminal (LSI internal memory back-up control), all functions apart from "memory protect" are cancelled.

- Pin 5 (FM)

The TX-710 is switched to FM mode when a low level input signal is applied to this terminal, this status being maintained even if the terminal is subsequently switched to high level (low level holding time: 5ms min).

- Pin 6 (MW)

Likewise, the TX-710 is switched to AM mode when a low level input signal is applied to this terminal, this status being maintained even if it is switched to high level soon afterwards (low level holding time: 5ms min).

- Pin 10 (CV out)

This is the analog switch output terminal where the output voltage applied to the variable capacitor appears.

- Pin 11 (CV in)

This is the analog switch input terminal to which the R-2R ladder output voltage is applied.

- Pin 13 (S-curve)

FM and AM S-curve voltages (representing the degree of change in detector DC level when tuning to and away from a station) are applied to

this AFC (Automatic Frequency Control) control signal input terminal.

- Pin 14 (UP)

When a low level signal is applied to this auto-search tuning input terminal, UP search tuning is commenced. This tuning mode is stopped again following AFC operation when the S-curve voltage is applied to pin 13 (UP search low level holding time: 5ms min). If the low level signal is applied continually during the UP search tuning mode, the tuning operation will continue even if the S-curve voltage is applied to pin 13.

- Pin 15 (DOWN)

Likewise, the application of a low level signal to this auto-search tuning input terminal results in the start of DOWN search tuning. The DOWN

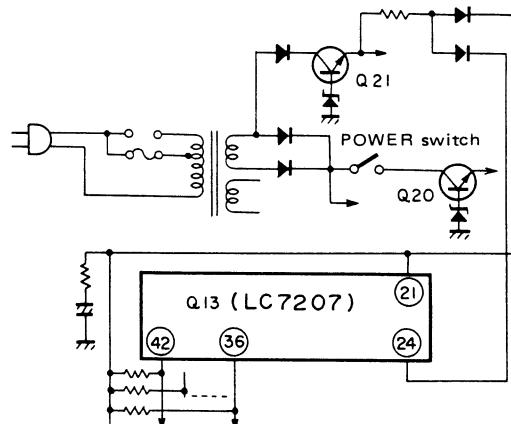


Fig. 4-2 Power supply back-up circuit

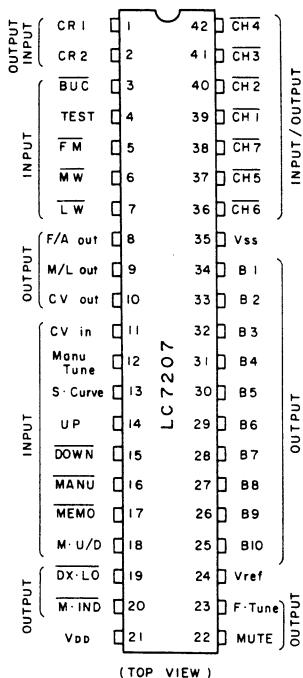


Fig. 4-3 LC7207 Top view

tuning mode is also stopped after AFC operation following the application of the S-curve voltage to pin 13 (DOWN search low level holding time: 5ms min). In this case, too, the search tuning mode is maintained if the low level signal is applied continually, even if the S-curve voltage is applied to pin 13.

- Pin 17 (MEMO)

The preset memory input terminal. Memory enable status is maintained only while a low level signal is applied to this terminal.

- Pin 19 (DX-LO)

This output terminal is used in the control of the reception sensitivity during auto-search mode. It is switched to low level only during search mode, and reverted to high level at all other times.

- Pin 21 (V_{DD})

The LSI power supply terminal.

- Pin 22 (MUTE)

During auto-search tuning and preset tuning modes, and when switching from one band to another, the high level output signal appearing at this terminal is used as the muting control signal.

- Pin 23 (F-Tune)

The 8-step PWM (pulse width modulation) output signal appearing at this terminal is used in fine tuning operations. (At all other times, a 50% duty signal, T = 1.5ms, is generated). The output signal is passed via an externally connected low-pass filter to form the compensatory voltage for fine tuning purposes.

- Pin 24 (V_{ref})

Reference voltage (for D-A converter, wind comparator and reference comparator).

- Pin 25 — Pin 34 (B10 — B1)

Outputs for the 10-bit up/down counter. With the R-2R ladder resistor connection, output signals are D-A (digital analog) converted.

- Pin 35 (V_{ss})

The LSI ground terminal.

- Pin 36 — Pin 42 (CH1 — CH7)

The frequencies of broadcasting stations stored in the memory are tuned by the corresponding terminal being switched to low level. And when the MEMO terminal is switched to low level, the frequency of the station tuned at that time will be stored in the memory. (Low level holding time for tuning and memory: 20ms min).

- Pins 12 and 16

FM and AM tracking purposes.

NOTE:

All other pins not included in the above list are not employed in the TX-710.

VOLTAGE SYNTHESIZER SYSTEM (LSI LC7207)

- Auto-Tuning

When either switch S8 (UP) or switch S7 (DOWN) is pressed, the corresponding LSI (LC7207) terminal pin 15 or pin 14 is connected to ground, resulting in the terminal being switched to low level. The control logic circuitry incorporated in the LSI is thereby activated, resulting in the start of either UP or DOWN search tuning operations. The subsequent sequence of events

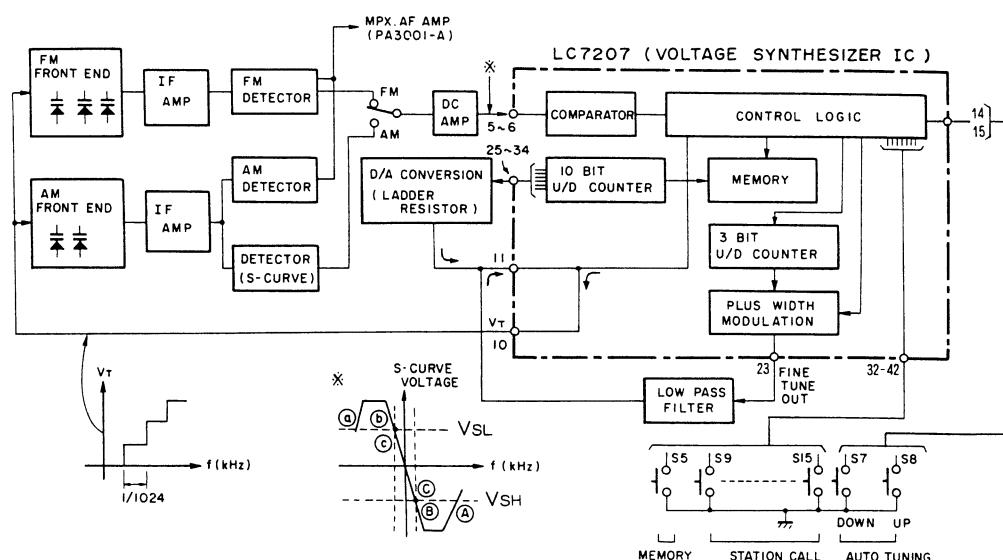


Fig. 4-4 Auto-tuning

following the pressing of the UP switch (S8) is described below.

The 10-bit UP/DOWN counter (rough tuning) is activated by an instruction from the control logic circuit, resulting in the digital code outputs stored in the memory circuit being applied to pins 25 to 34. This 10-bit code is D-A converted (digital to analog conversion) by the R-2R ladder resistor, and then passed one step (1/1024) at a time as tuning voltage (V_T).

This V_T is progressively increased one step at a time, resulting in the tuning frequency also being increased stepwise. And when the frequency of a broadcasting station is approached, the S-curve voltage passes the V_{SL} a point as shown in Fig. 4-4. With further increases in the V_T voltage, the S-curve voltage starts to decline again, passing through point V_{SL} ②. Then with continued decrease, a counter voltage at V_{SH} ③ is encountered. After completing these 3 steps from ① to ③, the auto-search mode is halted (rough tuning).

A 3-bit U/D counter employed for fine tuning purposes is then activated by an instruction from the control logic incorporated in the LC7207 LSI, resulting in the AFC operation (fine tuning) being started up by the S-curve.

On the other hand, when S7 (DOWN) is pressed, the procedure described above occurs in the reverse order. And when the frequency of a broadcasting station is approached, the S-curve voltage passes via the V_{SH} ① and ② S-curve voltage points and encounters V_{SL} at ③. The search is stopped automatically, resulting in the start of the AFC operation.

• AFC Operation (Fig. 4-5)

The AFC operation makes use of the S-curve characteristics (voltage) of the detector circuit during both FM and AM reception. In the AM

circuit, a ratio detector S-curve generator circuit is used, an output being obtained with a sufficiently high enough gain from the DC amplifier (see Fig. 4-4).

If for some reason, the tuned frequency is displaced to the high side of the broadcasting frequency, the S-curve voltage will generate a minus potential. V_{SL} and V_{SH} represent the upper and lower threshold levels of the LC7207 comparator shown in Fig. 4-5. Once the minus potential drops below the V_{SH} threshold, an instruction from the control logic is passed to the 10-bit U/D counter (for rough tuning) and the 3-bit U/D counter (for fine tuning). This results in control of the variable capacitor, leading to change in the tuning voltage (V_T) in order to recover the precise tuning position. If, on the other hand, the frequency is displaced on the low side, the control logic circuit is again activated (but due to a positive potential exceeding the V_{SL} threshold) resulting in the retention of the precise tuning point.

• S-Curve Detector Circuit (Fig. 4-6)

When a broadcasting station is tuned by auto-tuning, the exact tuning position is attained by AFC operation. The S-curve required for this AFC operation is detected in the following way.

The IF output signal is obtained from pin 7 of Q7 (PA3001-A) during FM reception, and from pin 11 of Q9 (HA1138) during AM reception. This IF is amplified by a differential amplifier circuit, and the S-curve subsequently detected by the ratio detector. S-curve displacement (i.e. shift in the center voltage of the S-curve) in both FM and AM mode is compared with a reference voltage (LC7207 V_{ref}) in Q12 (μ PC4558C), and the consequent error then applied to pin 13 of Q13 as the AFC operation control signal.

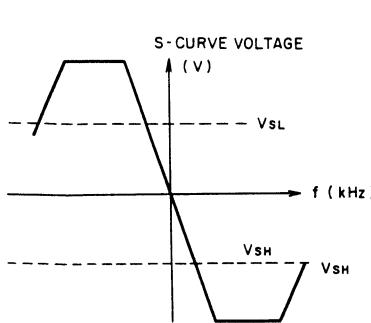
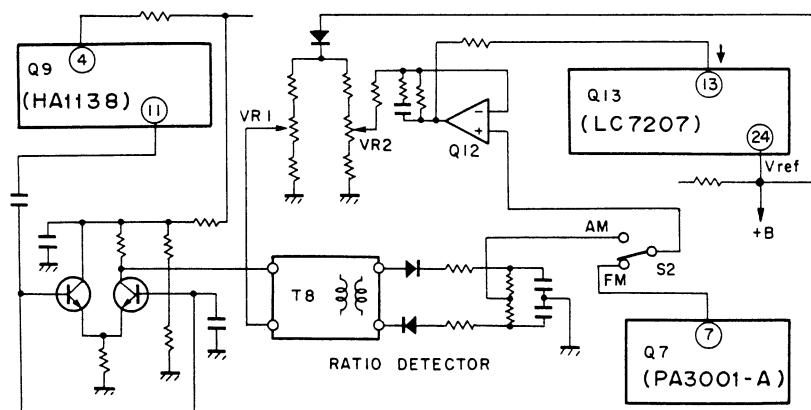


Fig. 4-5 S-Curve characteristics



IC · Q19 (μPD4011C) Functions

The NAND gate IC incorporated in Q19 forms a one-shot flip-flop which operates in combination with several other external circuit components for FM LOCAL and MEMORY control purposes.

• FM Local

(Note that FM LOCAL and FM MUTING involve the same type of operation).

Pin 3 of Q19 is switched to low level at the same time that the POWER switch is turned on. Q17 is thus turned on and the Q1 gate is dropped to 0V potential (normal bias), thereby resulting in normal front-end operation. In addition, switching pin 3 of Q19 to low level also keeps Q22 and D43 turned off.

If the FM LOCAL switch (S5) is then turned on, pins 6 and 1 of Q19 are also switched to low level, resulting in the pin 3 output being inverted to high level, and Q17 being turned off. The -B line voltage is thus applied to Q1 via R528 and R23 as reverse bias, thereby reducing the Q1 gain, and subsequently the sensitivity of the front-end. Any broadcasting frequencies below a certain fixed level will not, therefore, be received.

Pin 19 of Q13 is normally at high level, being switched to low level only during auto-search tun-

ing mode. Once a broadcasting station is tuned and the auto-search mode is stopped, the pin 19 output is switched back to high level, and Q27 consequently turned on. This results in Q17 being turned on, thereby cancelling the reverse bias applied to Q1. With Q1 operating normally again, the broadcasting frequency will be received at high sensitivity.

• MEMORY and STATION CALL

Frequencies of tuned broadcasting stations are stored in the memory by the following procedure.

As can be seen in Fig. 4-7, this circuit is also formed by a flip-flop. When the MEMORY switch S6 is turned on, pin 8 of Q19 is switched to low level, resulting in the output of Q19 pin 10 being switched to high level for a fixed period of time (determined by the C504/R510 time constant — memory enable period: approx. 5 seconds). This results in Q23 being turned on and pin 17 of Q13 being switched to low level, thereby enabling tuned frequencies to be stored in the memory block inside the LSI.

If the STATION CALL switch (preset switch) S9 is then pressed, +B will be connected to ground via R512, D28, D47 and D59, resulting in pin 13 of Q19 being switched to low level, and pin 10

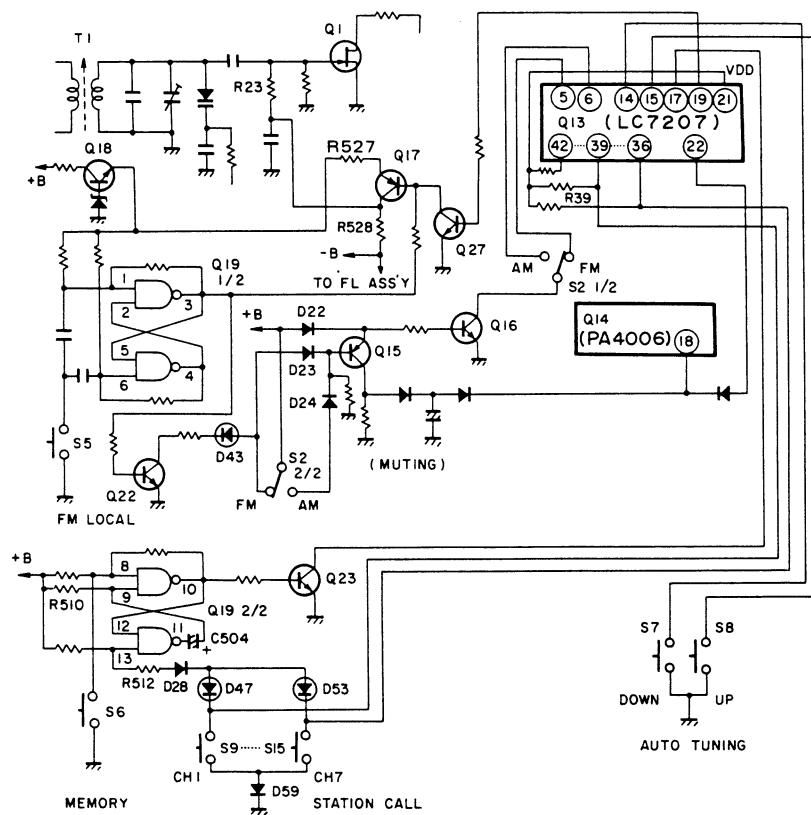


Fig. 4-7 FM local, memory and station call circuit

being reset to high level. Q23 will thus be turned on and pin 17 of Q13 switched to low level (and the tuned broadcasting frequency will thus be stored in the memory).

Pins 36 to 42 of Q13 are the preset input terminals. When the S9 switch is pressed, the V_{DD} voltage (IC reference voltage) is passed to ground via R428, S9 and D59, resulting in a drop in the voltage being applied to pin 39 of Q13. Pin 39 is thus switched to low level, and the tuned broadcasting station is thereby stored in CH1.

Station Calling

The frequencies of preset broadcasting stations are retrieved in the following way.

When a STATION CALL switch (S9—S15) is pressed, pin 17 of Q13 is switched to low level. An instruction is thus issued from the LSI (LC7207) control logic, resulting in the activation of the 10-bit U/D counter in accordance to the frequency data stored in the memory block. Then the memory stored frequency is hunted by ladder resistance, and the U/D counter again activated for AFC operation and fine tuning purposes.

DISPLAY CIRCUIT

This LSI controls the display of tuned FM frequencies (5 digit display to the nearest 50kHz) and tuned AM frequencies (4 digit display to the nearest 1kHz).

During FM reception, the FM LOCAL signal (the actual tuned frequency + IF frequency) divided by 100 in the prescalar IC (M54459L) is applied to pin 6 of Q25 (LS7258). A reference frequency (4MHz) is generated on pins 19 and 20 of Q25 by a crystal oscillator. This reference frequency is then divided by the LSI counter to a frequency which permits direct comparison with the input signal applied to pin 6.

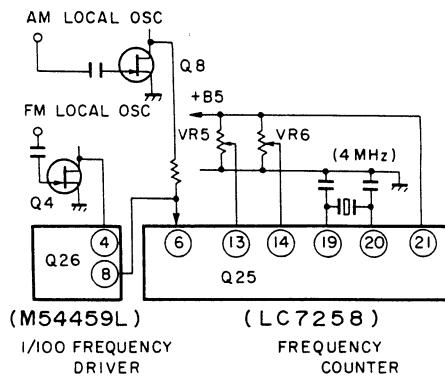


Fig. 4-8 Display circuit

Upon comparison with the pin 6 input signal, the output is passed to the frequency counter. A latch circuit stores each signal temporarily for a brief period while waiting for the previous frequency display to be completed. The signal from the frequency counter is then displayed as the tuned frequency in the fluorescent display tube by command from the segment driver circuit.

Frequency display discrepancies (in 50kHz units in the FM band, and 1kHz units in the AM band) caused by drift in the IF circuit are corrected by the IF frequency fine tuning circuit where frequency shifts are converted to voltage levels in the VR connected to pins 13 and 14. In other words, frequency drift is corrected by voltage adjustment in the pin 13/14 VR.

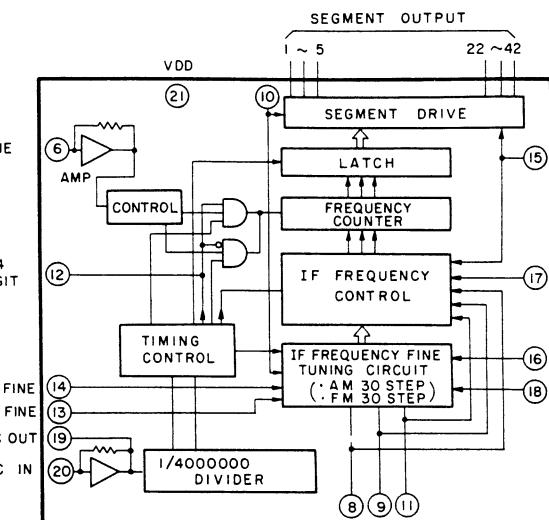
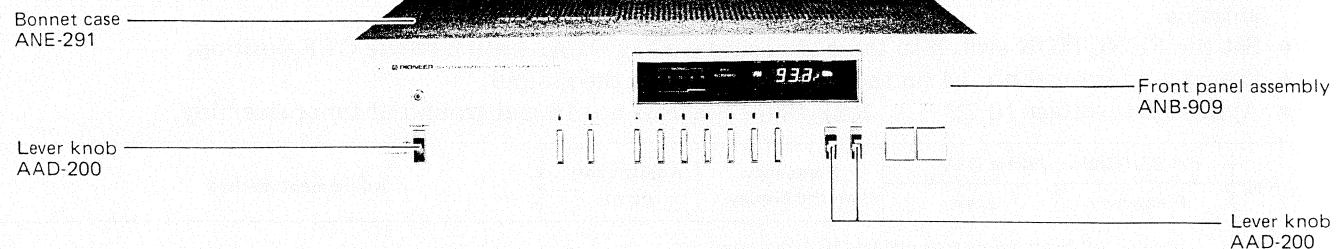


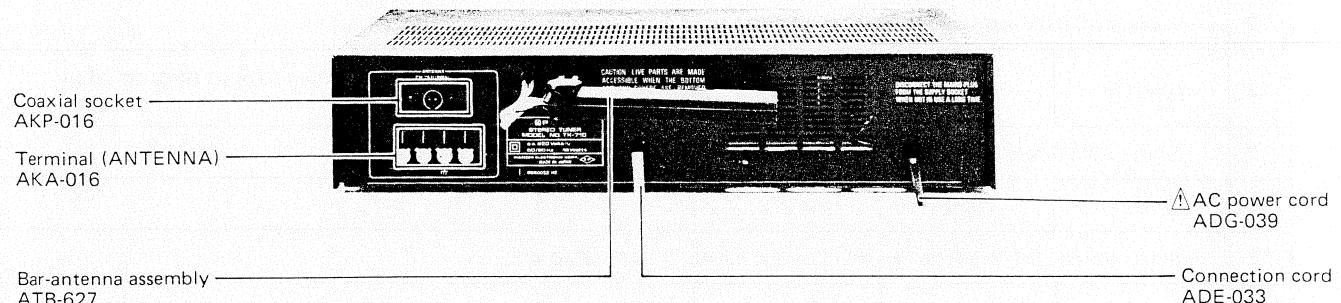
Fig. 4-9 LC7258 Block diagram

5. PARTS LOCATION

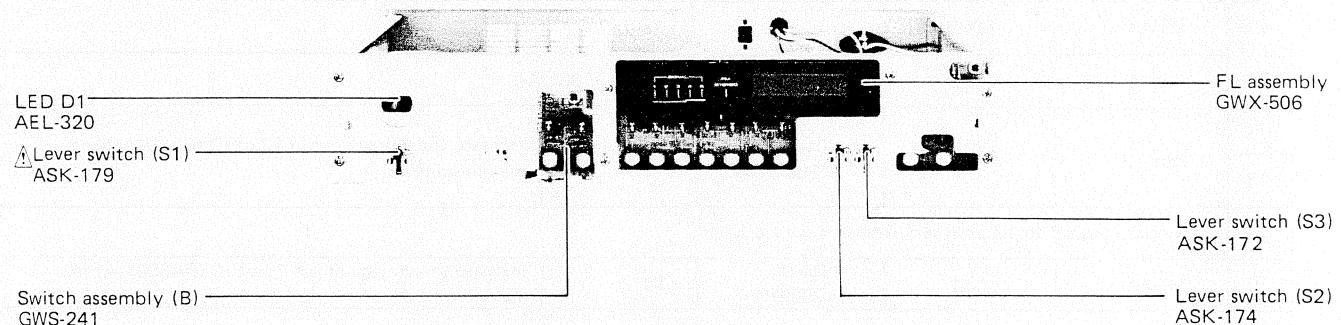
Front Panel View



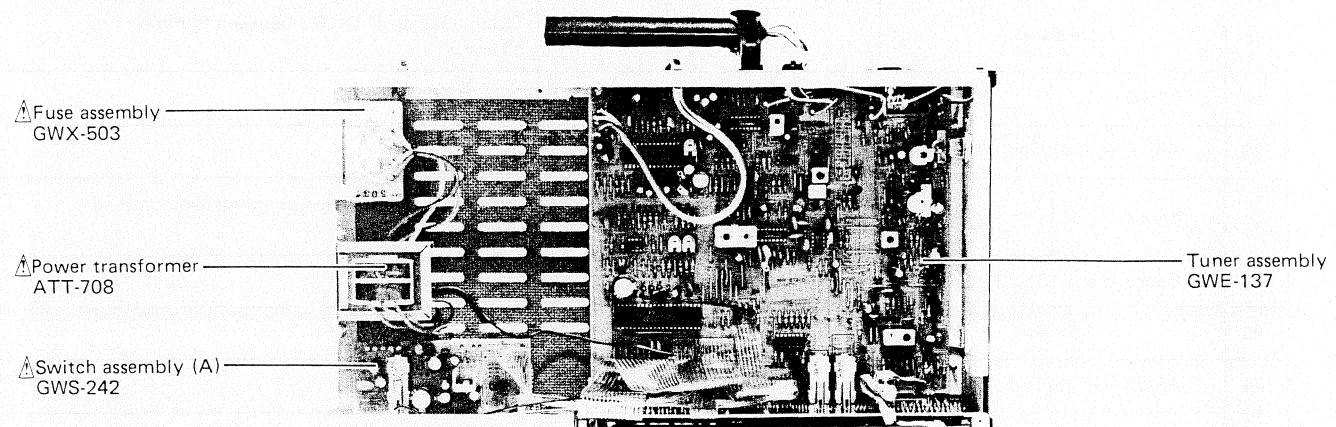
Rear Panel View



Front Panel with Panel Removed



Top View with Top Plate Removed



6. ADJUSTMENTS

FM Tuner

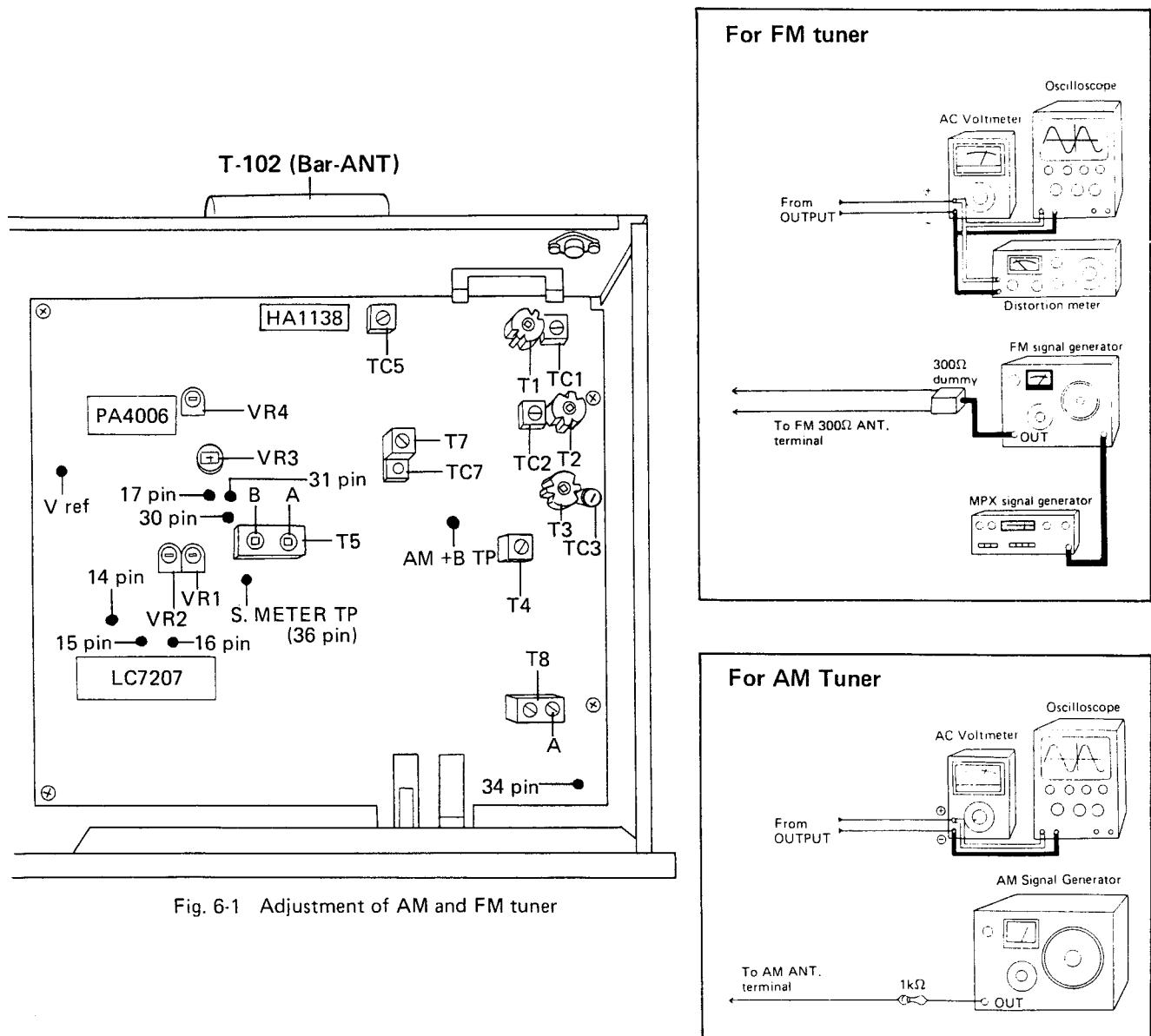
- Connect the FM SG (FM signal generator) to the FM ANTENNA 300Ω terminal via 300Ω dummy antenna.
- Set the FUNCTION switch to the FM position, FM LOCAL switch to the OFF position.
- Connect a terminal no. 14 on the tuner assembly to the ground.
- Apply a DC voltage [0.7V ~ V. REF (8.6V)] across no. 16 and ground of tuner assembly.

| Step | FM SG (400Hz, 75kHz DEV) | | Frequency on the display | Adjustment point | Adjustment method |
|------|---|-------|-----------------------------|---------------------|--|
| | Frequency | Level | | | |
| 1 | Apply a DC 0.7V across terminal no. 16 and ground. | | | | |
| 2 | 87MHz | 80dB | ..... | T3 | Increase the voltage at pin 13 of IC (PA3001-A) to maximum level. |
| 3 | Apply a DC 8.6V across terminal no. 16 and ground. | | | | |
| 4 | 109MHz | 80dB | ..... | TC3 | Increase the voltage at pin 13 of IC (PA3001-A) to maximum level. |
| 5 | Repeat steps 1 to 4 until both requirements are satisfied. | | | | |
| 6 | 106MHz | 80dB | ..... | ..... |  |
| 7 | Adjust the applied voltage to maximum level at pin 13 of IC (PA3001-A). | | | | |
| 8 | 106MHz | 20dB | 106MHz (± 200 kHz) | TC1 | Increase the voltage at pin 13 of IC (PA3001-A) to maximum level. |
| 9 | | | | TC2 | |
| 10 | 90MHz | 80dB | ..... | ..... | ..... |
| 11 | Adjust the applied voltage to maximum level at pin 13 of IC (PA3001-A). | | | | |
| 12 | 90MHz | 20dB | 90MHz (± 200 kHz) | T1 | Increase the voltage at pin 13 of IC (PA3001-A) to maximum level. |
| 13 | | | | T2 | |
| 14 | Repeat steps 6 to 13 both requirements are satisfied. | | | | |
| 15 | 98MHz | 20dB | 98MHz (± 200 kHz) | T4 | Increase the voltage at pin 13 of IC (PA3001-A) to maximum level. |
| 16 | No signal |  | ..... | ..... | ..... |
| 17 | Adjust the applied voltage to minimum level at pin 13 of IC (PA3001-A). | | | | |
| 18 | No signal |  | ..... | T5 (A) | Obtain reading of DC 0V between terminals no. 30 and 31. |
| 19 | 98MHz | 20dB | ..... | ..... | ..... |
| 20 | Adjust the applied voltage to maximum level at pin 13 of IC (PA3001-A). | | | | |
| 21 | 98MHz | 60dB | 98MHz (± 200 kHz) | T5 (B) | Obtain minimum distortion in the demodulated output (OUTPUT). |
| 22 | Repeat steps 16 to 21 until both requirements are satisfied. | | | | |
| 23 | No signal |  | ..... | ..... | ..... |
| 24 | Adjust the applied voltage to minimum level at pin 13 of IC (PA3001-A). | | | | |
| 25 | No signal |  | ..... | VR2 | Obtain a reading of DC 4.75V (within ± 200 mV) between terminal no. 15 and ground. |

FM Multiplex Decoder circuit

- Connect the MPX SG (FM multiplex signal generator) to the FM SG external modulator terminal.
- Set the FM SG output to 98MHz and 66dB (modulation mode to external), and tune the TX-710 to 98MHz.

| Step | FM MPX SG | Adjustment point | Adjustment method |
|------|--|--|--|
| 1 | No signal (unmodulated) | VR3 | Obtain a 76kHz (within ± 250 Hz) signal at terminal No.17. |
| 2 | Pilot signal only 19kHz ± 7.5 kHz DEV. | VR4 | Obtain minimum leakage of the 19kHz pilot signal at the OUTPUT terminal. |
| 3 | Main: 1kHz, L+R, ± 67.5 kHz DEV. Pilot: 19kHz, ± 7.5 kHz DEV. | T4 (by up to 90° in either direction) | Reduce distortion in the output terminal to a minimum. |



AM Tuner

- Connect the AM SG (AM signal generator) to the AM ANTENNA terminal via $1k\Omega$ resistor.
- Set the FUNCTION selector to the AM position.
- Connect a terminal no.14 on the tuner assembly to the ground.
- Apply a DC voltage [0.7V ~ V. REF (8.6V)] across no.16 and ground of tuner assembly.

| Step | AM SG (400Hz, 30% MOD) | | Frequency on the display | Adjustment point | Adjustment method |
|------|--|-------|-----------------------------|---------------------|---|
| | Frequency | Level | | | |
| 1 | Apply a DC 0.7V across terminal no. 16 and ground. | | | | |
| 2 | 510kHz | 100dB | ..... | T7 | Increase the voltage at pin 9 of IC (HA1138) to maximum level. |
| 3 | Apply a DC 8.6V across terminal no. 16 and ground. | | | | |
| 4 | 1650kHz | 100dB | ..... | TC7 | Increase the voltage at pin 9 of IC (HA1138) to maximum level. |
| 5 | Repeat steps 1 to 4 until both requirements are satisfied. | | | | |
| 6 | 1400kHz | 100dB | ..... | ..... | ..... |
| 7 | Adjust the applied voltage to maximum level at pin 9 of IC (HA1138). | | | | |
| 8 | 1400kHz | 40dB | 1400kHz (± 3 kHz) | TC5 | Increase the voltage at pin 9 of IC (HA1138) to maximum level. |
| 9 | 600kHz | 100dB | ..... | ..... | ..... |
| 10 | Adjust the applied voltage to maximum level at pin 9 of IC (HA1138). | | | | |
| 11 | 600kHz | 40dB | 600kHz (± 3 kHz) | T102 (Bar-ANT) | Increase the voltage at pin 9 of IC (HA1138) to maximum level. |
| 12 | Repeat steps 6 to 11 until both requirements satisfied. | | | | |
| 13 | 1000kHz | 40dB | ..... | ..... | Fine tuning (1000kHz) |
| 14 | Connect the terminals no.23 to no.27 tuner assembly. | | | | |
| 15 | No signal |  | ..... | VR1 | Obtain a reading of DC 4.75V (within ± 200 mV) between terminal no.15 and ground. |
| 16 | Adjust the applied voltage to maximum level at pin 9 of IC (HA1138). | | | | |
| 17 | 1000kHz | 40dB | 1000kHz (± 3 kHz) | TA8(A) | Obtain a reading of DC 4.75V (within ± 200 mV) between terminal no.15 and ground. |

Counter

FM

- Connect the FM SG (FM signal generator) to the FM ANTENNA 300Ω terminal via 300Ω dummy.
- Set the FUNCTION selector the FM position, FM LOCAL switch to the OFF position.
- Connect an $12k\Omega$ resistor between 34 pin and ground.

| Step | FM SG (400Hz, ± 75 kHz DEV) | | Frequency on the display | Adjustment point | Adjustment method |
|------|---------------------------------|-------|-----------------------------|---------------------|--|
| | Frequency | Level | | | |
| 1 | 98MHz | 60dB | 98MHz | VR5 | <ul style="list-style-type: none"> • Tune by auto-search tuning. • Then adjust VR5 so that the 100kHz unit in the digital display (98.00MHz) stops blinking on and off upon auto-stop. |

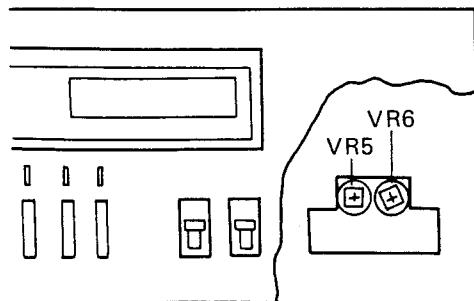


Fig. 6-2 Adjustment of counter

AM

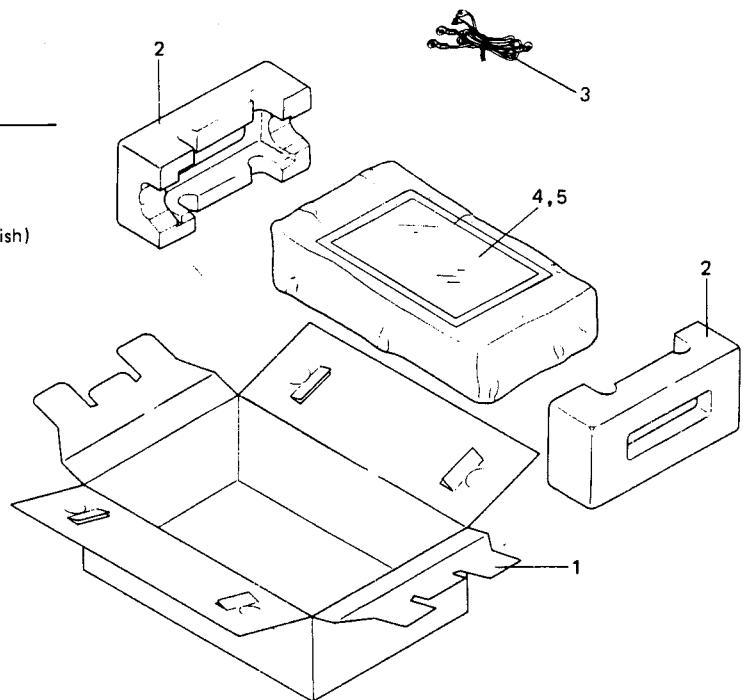
- Connect the AM SG (AM signal generator) to the AM ANTENNA terminal via $1\text{k}\Omega$ resistor.
- Set the FUNCTION selector to the AM position.
- Connect an $33\text{k}\Omega$ resistor between 34 pin and AM + B T.P

| Step | AM SG (400Hz, 30% MOD) | | Frequency on the display | Adjustment point | Adjustment method |
|------|------------------------|-------|--------------------------|------------------|---|
| | Frequency | Level | | | |
| 1 | 1000kHz | 60dB | 1000kHz | VR6 | <ul style="list-style-type: none"> • Tune by auto-search tuning. • Then adjust VR6 so that the 1kHz unit in the digital display (1000kHz) stops blinking on and off upon auto-stop. |

7. PACKING

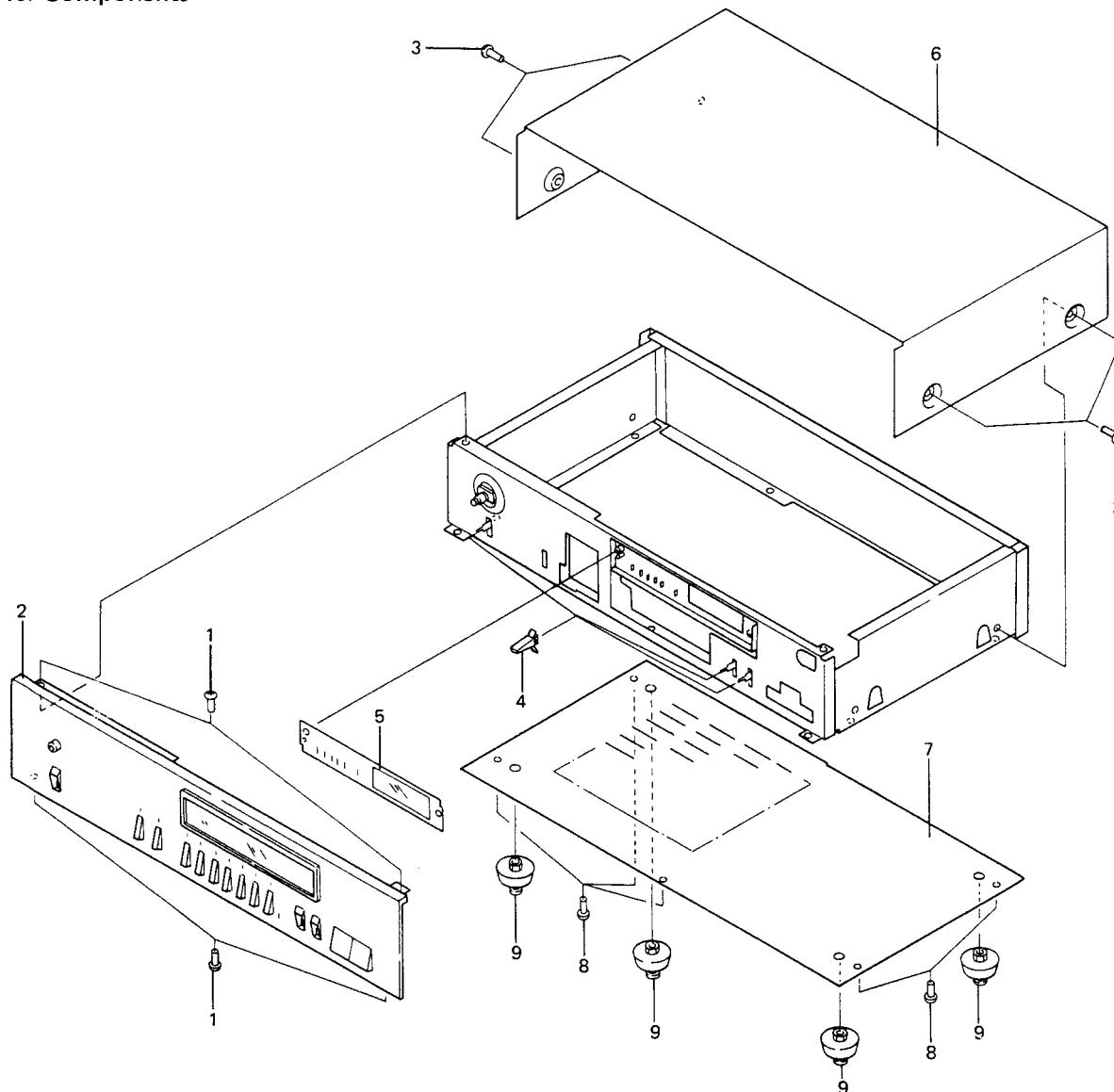
Parts List

| Key No. | Part No. | Description |
|---------|----------|--|
| 1. | AHD-789 | Packing case |
| 2. | AHA-234 | Side pad |
| 3. | ADH-004 | FM antenna |
| 4. | ARB-377 | Operating instructions (English) |
| 5. | ARD-150 | Operating instructions (German/French) |



8. EXPLODED VIEWS

Exterior Components



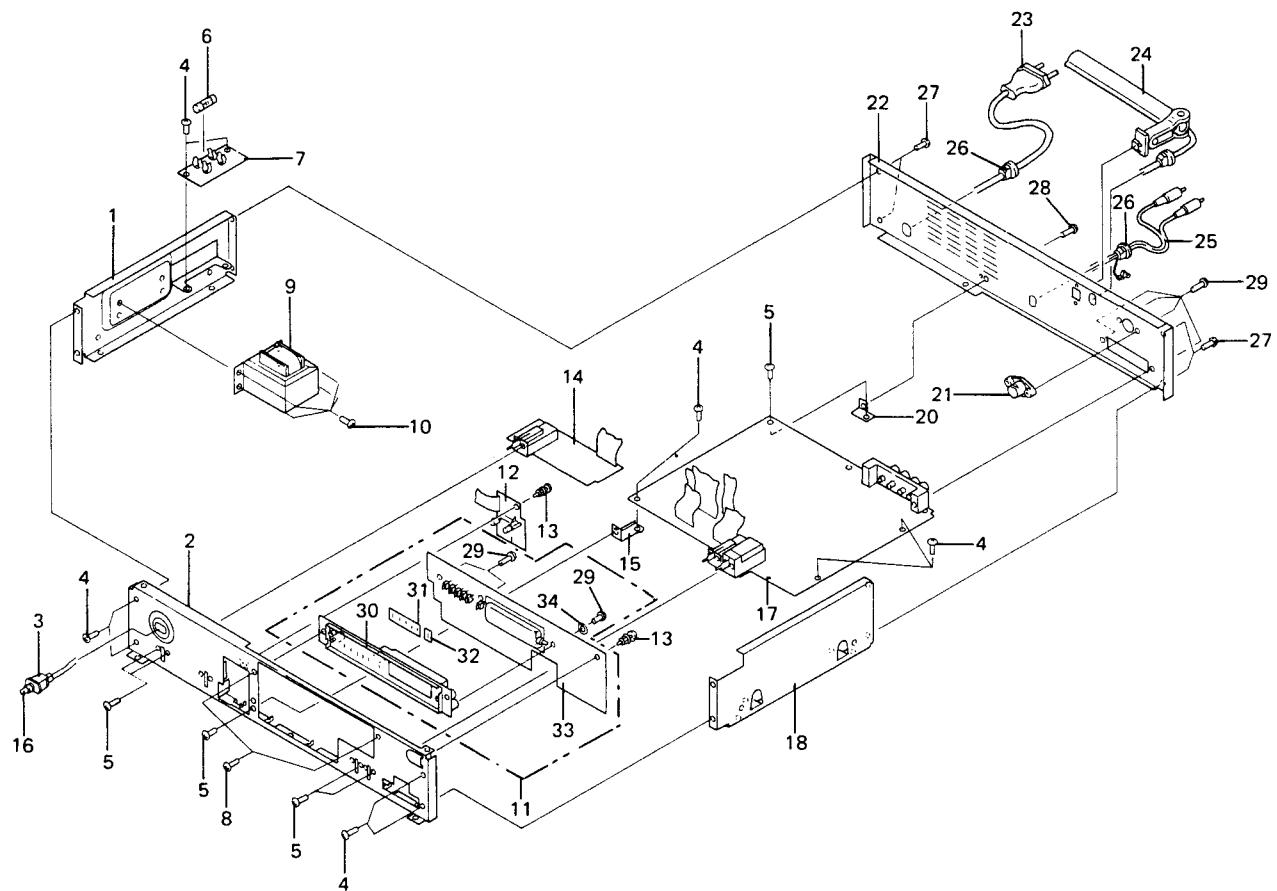
NOTES:

- Parts without part number cannot be supplied.
- The  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

Parts List

| Key No. | Part No. | Description | Key No. | Part No. | Description |
|---------|--------------|----------------------|---------|----------|---------------|
| 1. | VBZ30P060FMC | Screw | 6. | ANE-291 | Bonnet case |
| 2. | ANB-909 | Front panel assembly | 7. | | Bottom plate |
| 3. | FBT40P080FZK | Screw | 8. | ABA-246 | Screw |
| 4. | AAD-200 | Lever knob | 9. | AEC-609 | Foot assembly |
| 5. | | Acrylic plate A | | | |

Interior Components



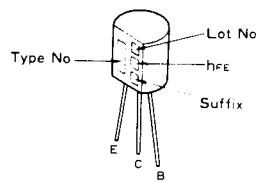
Parts List

| Key No. | Part No. | Description | Key No. | Part No. | Description |
|---------|--------------|-------------------|---------|--------------|----------------------|
| 1. | | Side frame L | 21. | AKP-016 | Coaxial socket |
| 2. | | Panel stay | 22. | | Rear panel |
| 3. | | LED socket | 23. | ADG-039 | AC power cord |
| 4. | VBZ30P060FMC | Screw | 24. | ATB-627 | Bar-antenna assembly |
| 5. | PMZ30P060FMC | Screw | 25. | ADE-033 | Connection cord |
| 6. | AEK-402 | Fuse T1A (FU1) | 26. | AEC-327 | Strain relief |
| 7. | GWX-503 | Fuse assembly | 27. | BBT30P080FZK | Screw |
| 8. | VBZ30P080FMC | Screw | 28. | PMT30P060FZK | Screw |
| 9. | ATT-708 | Power transformer | 29. | VBZ30P100FZK | Screw |
| 10. | VBZ40P080FZK | Screw | 30. | | FL cover |
| 11. | GWX-506 | FL assembly | 31. | | Felt A |
| 12. | GWS-241 | Switch assembly B | 32. | | Felt B |
| 13. | AEC-510 | Nylon rivet | 33. | | P.C. board |
| 14. | GWS-242 | Switch assembly A | 34. | ABE-061 | Washer |
| 15. | | PCB holder A | | | |
| 16. | AEL-320 | LED D1 | | | |
| 17. | GWE-137 | Tuner assembly | | | |
| 18. | | Side frame R | | | |
| 19. |  | ..... |  |  |  |
| 20. | | PCB holder B | | | |

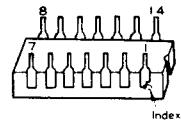
9. SCHEMATIC DIAGRAM, P.C. BOARDS CONNECTION DIAGRAM AND PARTS LIST

External Appearance of Transistors and ICs

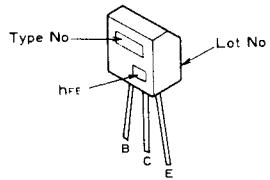
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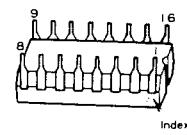
μ PD4011C
MB84011M



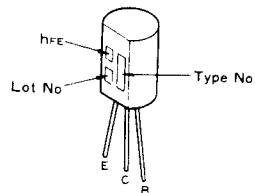
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2SC535



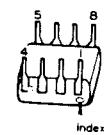
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PA3001



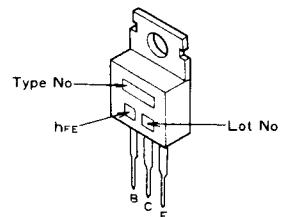
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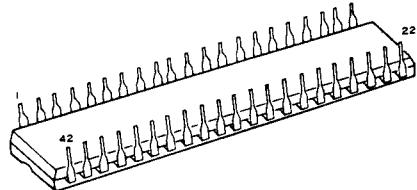
HA1201
 μ PC4558C
NJM4558DV



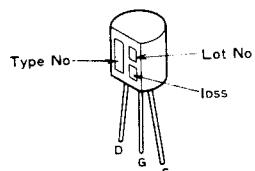
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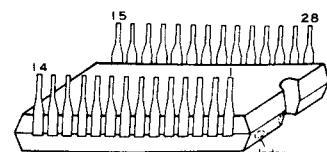
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LC7258



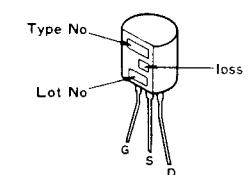
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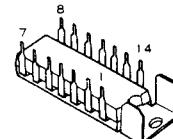
PA4006-A



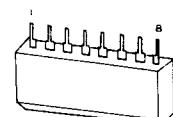
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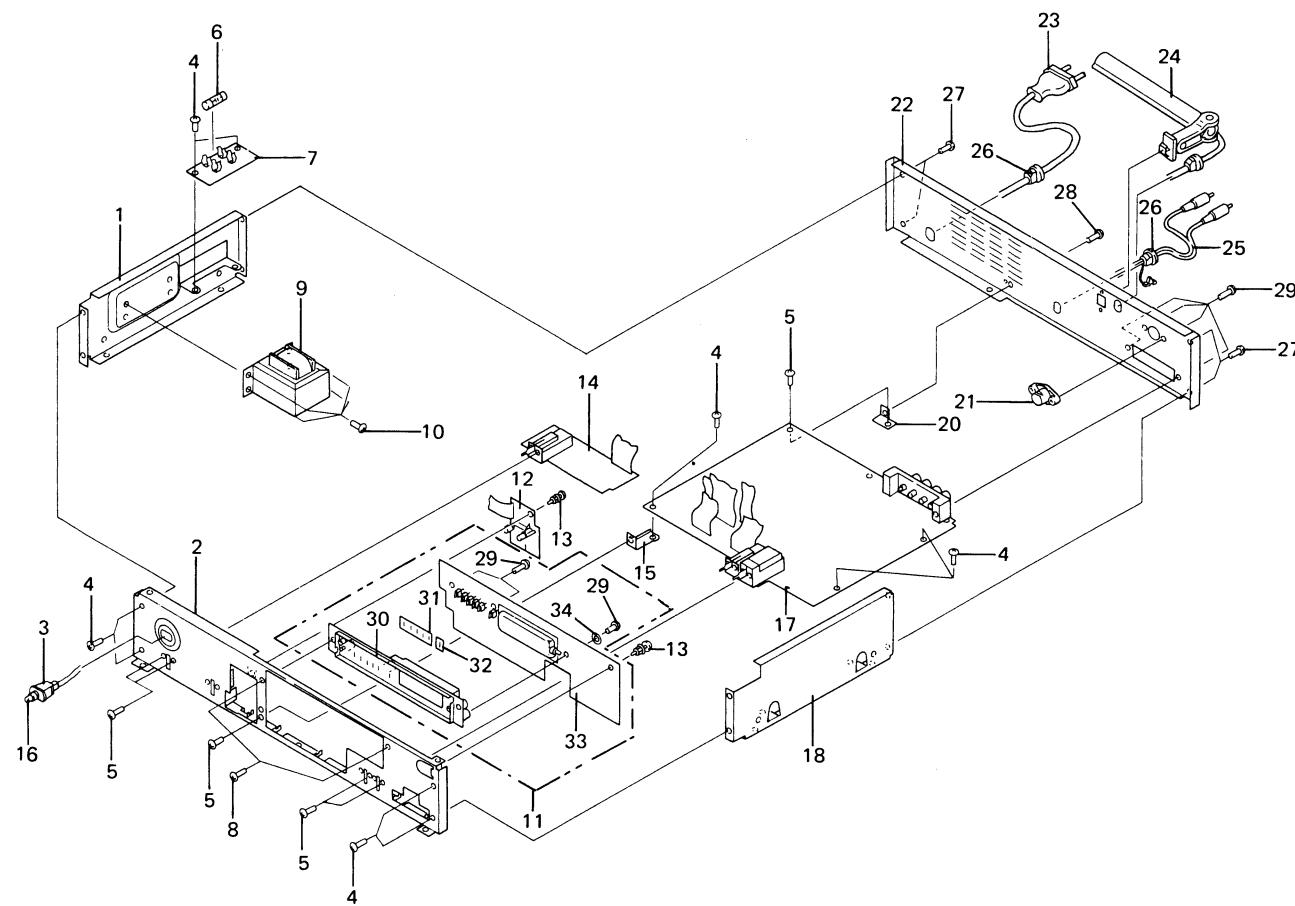
LB1416



M54459L



Interior Components

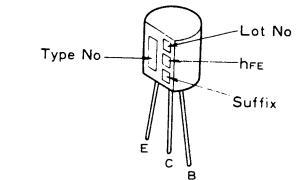
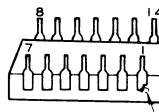
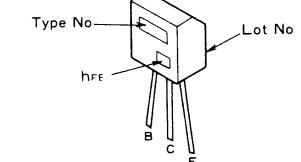
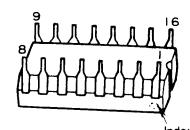


Parts List

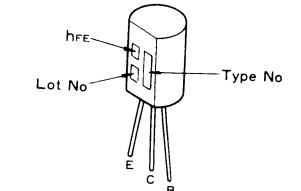
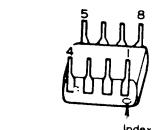
| Key No. | Part No. | Description | Key No. | Part No. | Description |
|---------|--------------|-------------------|---------|--------------|----------------------|
| 1. | | Side frame L | 21. | AKP-016 | Coaxial socket |
| 2. | | Panel stay | 22. | | Rear panel |
| 3. | | LED socket | 23. | ADG-039 | AC power cord |
| 4. | VBZ30P060FMC | Screw | 24. | ATB-627 | Bar-antenna assembly |
| 5. | PMZ30P060FMC | Screw | 25. | ADE-033 | Connection cord |
| 6. | AEK-402 | Fuse T1A (FU1) | 26. | AEC-327 | Strain relief |
| 7. | GWX-503 | Fuse assembly | 27. | BBT30P080FZK | Screw |
| 8. | VBB30P080FMC | Screw | 28. | PMT30P060FZK | Screw |
| 9. | ATT-708 | Power transformer | 29. | VBB30P100FZK | Screw |
| 10. | VBB40P080FZK | Screw | 30. | | FL cover |
| 11. | GWX-506 | FL assembly | 31. | | Felt A |
| 12. | GWS-241 | Switch assembly B | 32. | | Felt B |
| 13. | AEC-510 | Nylon rivet | 33. | | P.C. board |
| 14. | GWS-242 | Switch assembly A | 34. | ABE-061 | Washer |
| 15. | | PCB holder A | | | |
| 16. | AEL-320 | LED D1 | | | |
| 17. | GWE-137 | Tuner assembly | | | |
| 18. | | Side frame R | | | |
| 19. |  | ..... |  |  |  |
| 20. | | PCB holder B | | | |

9. SCHEMATIC DIAGRAM, P.C. BOARDS CONNECTION DIAGRAM AND PARTS LIST

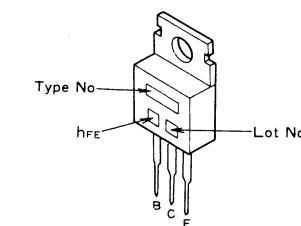
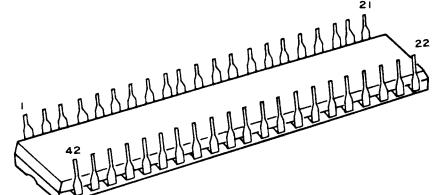
External Appearance of Transistors and ICs

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MB84011M2SC461
2SC535HA1138
PA3001

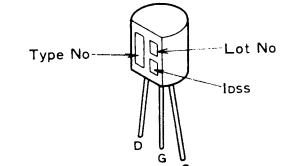
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HA1201
μPC4558C
NJM4558DV

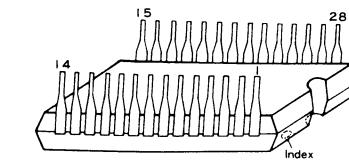
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LC7207
LC7258

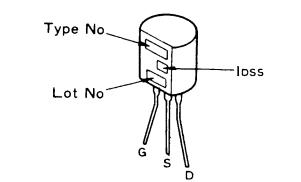
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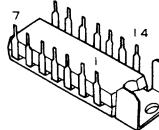
PA4006-A



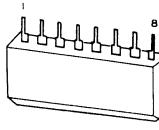
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LB1416



M54459L

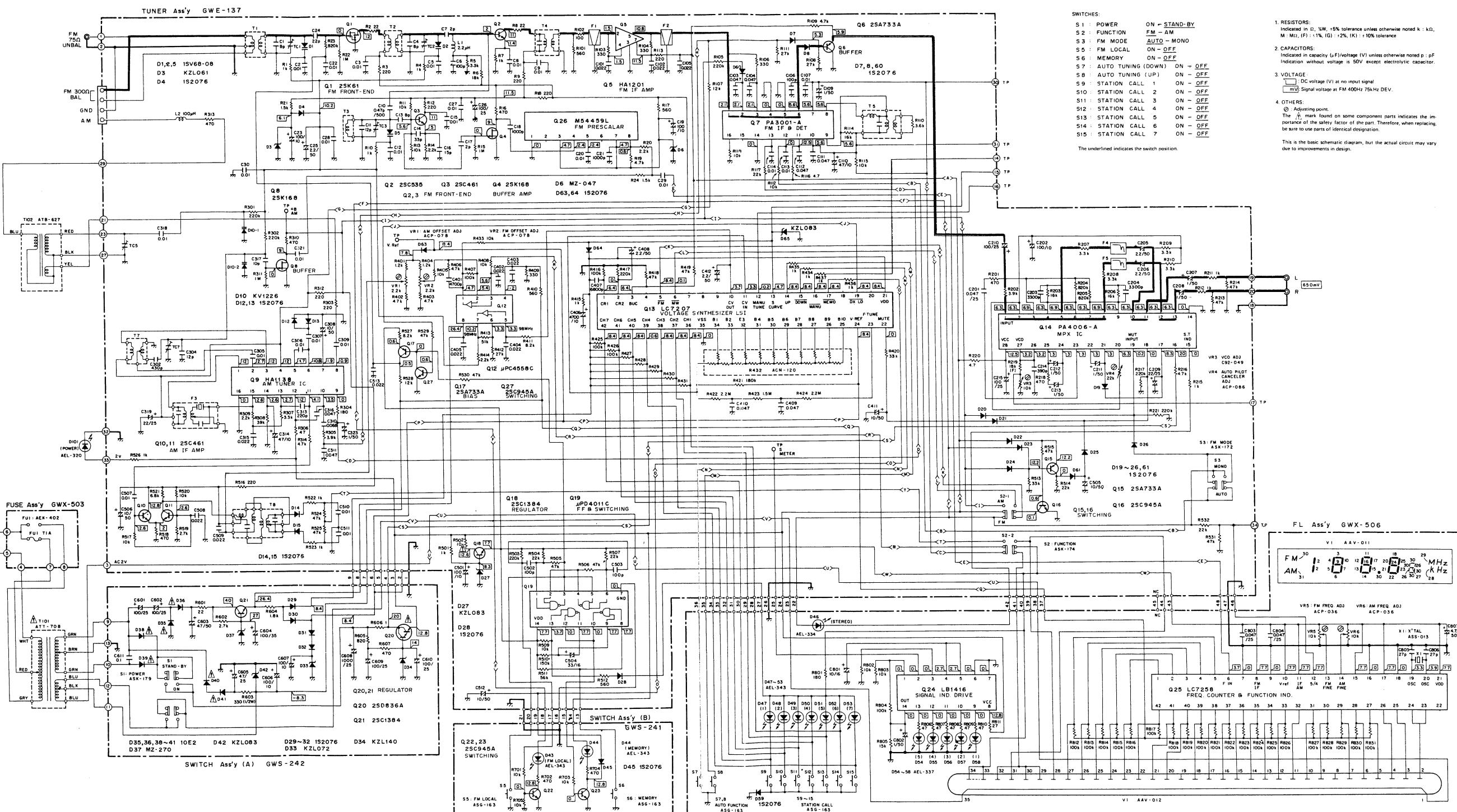


9.1 SCHEMATIC DIAGRAM

NOTE:

The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.

A



1

2

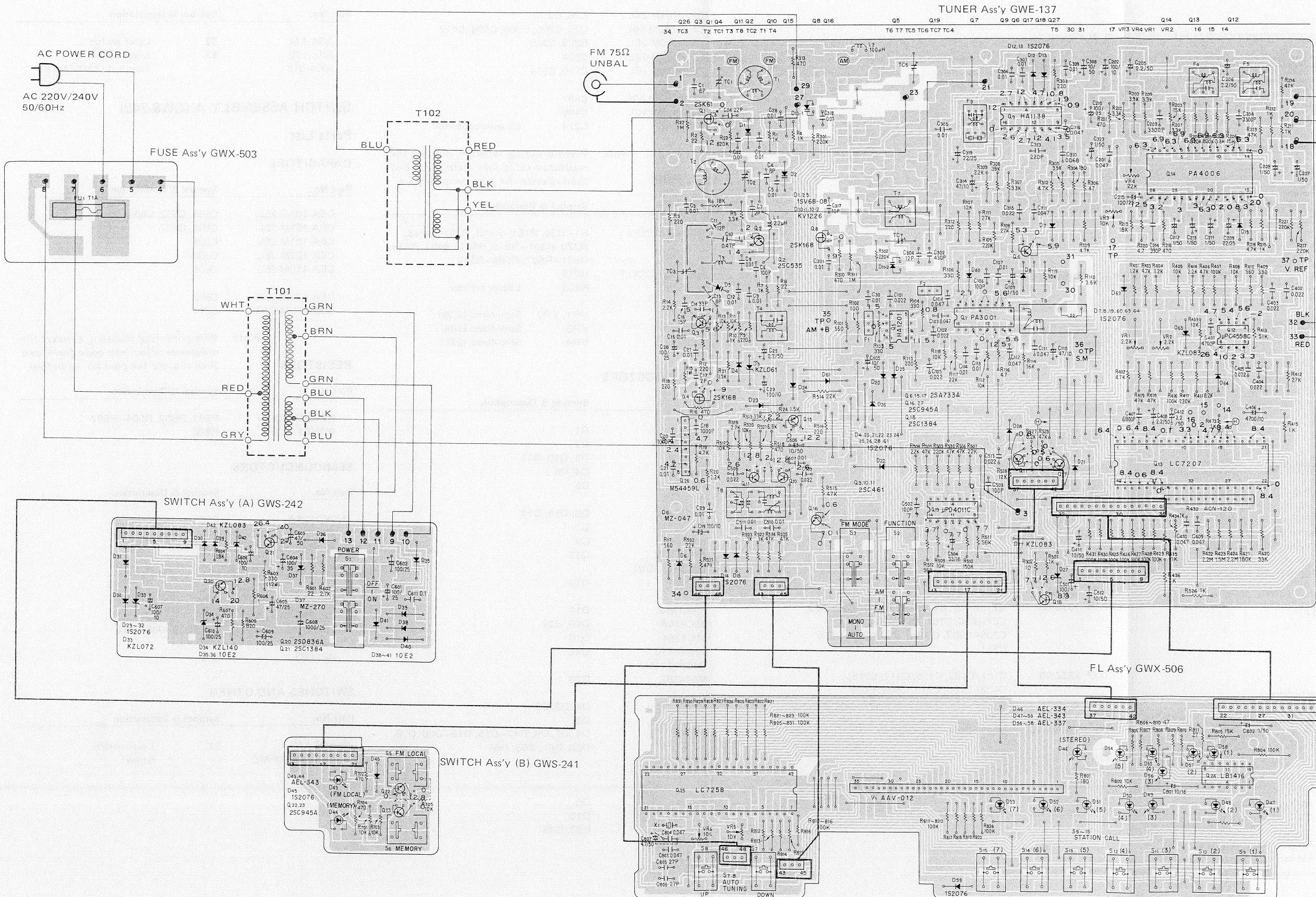
3

4

5

6

9.2 P.C. BOARDS CONNECTION DIAGRAM



9.3 PARTS LIST

NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.
- Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

| | | | |
|------|----------------------|-----|-------------------------|
| 560Ω | 56 × 10 ¹ | 561 | RD ¹ PS 561J |
| 47kΩ | 47 × 10 ³ | 473 | RD ¹ PS 473J |
| 0.5Ω | 0R5 | | RN2H 0R5K |
| 1Ω | 010 | | RSIP 010K |
- Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

| | | | |
|--------|-----------------------|------|--------------------------|
| 5.62kΩ | 562 × 10 ¹ | 5621 | RN ¹ SR 5621F |
|--------|-----------------------|------|--------------------------|

- The  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

Miscellaneous Parts

P.C. BOARD ASSEMBLIES

| Part No. | Symbol & Description |
|----------|----------------------|
| GWE-137 | Tuner assembly |
| GWS-242 | Switch assembly (A) |
| GWS-241 | Switch assembly (B) |
| GWX-503 | Fuse assembly |
| GWX-506 | FL assembly |

OTHERS

| Part No. | Symbol & Description |
|---|------------------------|
|  AEK-402 | FU1 Fuse T1A |
|  ADG-039 | AC power cord |
|  ATT-708 | T101 Power transformer |
| AKP-016 | Coaxial socket |
| ATB-627 | Bar-antenna assembly |
| ADE-033 | Connection cord |

TUNER ASSEMBLY (GWE-137)

Parts List

TRANSFORMERS, COILS

| Part No. | Symbol & Description |
|----------|---------------------------|
| ATC-112 | T1 FM antenna coil |
| ATC-121 | T2 FM high frequency coil |
| ATC-115 | T3 FM OSC coil |
| ATE-039 | T4 FM IFT |
| ATE-043 | T5 FM DET. transformer |
| ATB-067 | T7 AM OSC coil |
| ATB-070 | T8 AM DET. transformer |
| ATF-053 | F1, F2 FM ceramic filter |
| ATF-108 | F3 AM ceramic filter |
| ATF-089 | F4, F5 Low pass filter |
| T24-028 | L1 RF coil |

| Part No. | Symbol & Description |
|--------------|-----------------------------|
| CEA 101M 25L | C26, C215 |
| CEA 2R2M 50L | C25, C205, C206, C408, C412 |
| CEA 220M 25L | C209, C319 |
| CEA 330M 16L | C504 |
| CEA 470M 10L | C110, C314 |
| CEA 4R7M 50L | C807 |
| CEA 472M 10L | C406 |
| ACG-018 | C214 Ceramic capacitor |

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

| Part No. | Symbol & Description |
|---------------------------|--|
| RD ¹ PM 000 J | R1—R24, R101—R118, R201—R218, R220, R301—R315, R401—R431, R433, R501—R507, R509—R532 |
| RN ¹ PQ 0000 F | R219 |
| ACN-120 | R432 Ladder resistor |
| ACP-078 | VR1, VR2 Semi-fixed (2.2k) |
| C92-049 | VR3 Semi-fixed (10k) |
| ACP-086 | VR4 Semi-fixed (22k) |

SEMICONDUCTORS

| Part No. | Symbol & Description |
|----------------------|----------------------|
| 2SK61-Y | Q1 |
| 2SC535 | Q2 |
| 2SC461 | Q3, Q10, Q11 |
| 2SK168 | Q4, Q8 |
| HA1201 | Q5 |
| 2SA733A | Q6, Q15, Q17 |
| PA3001-A | Q7 |
| HA1138 | Q9 |
| μPC4558C (NJM4558DV) | Q12 |
| LC7207 | Q13 |
| PA4006-A | Q14 |
| 2SC945A | Q16, Q27 |
| 2SC1384 | Q18 |
| μPD4011C (MB84011M) | Q19 |
| M54459L | Q26 |

| Part No. | Symbol & Description |
|----------|---|
| 1SV68-08 | D1, D2, D5 |
| KZL061 | D3 |
| 1S2076 | D4, D7, D8, D12—D15, D19—D26, D28, D60, D61, D63, D64 |
| (1S2473) | |
| (1S1555) | |
| MZ-047 | D6 |
| KV1226-Y | D10 |
| KZL-083 | D27, D65 |

SWITCHES AND OTHER

| Part No. | Symbol & Description |
|----------|----------------------|
| ASK-174 | S2 Lever switch |
| ASK-172 | S3 Lever switch |
| AKA-016 | Terminal (ANTENNA) |

SWITCH ASSEMBLY A (GWS-242)

Parts List

CAPACITORS

| Part No. | Symbol & Description |
|--------------|------------------------|
| CEA 101M 25L | C601, C602, C609, C610 |
| CEA 101M 10L | C606, C607 |
| CEA 101M 35L | C604 |
| CEA 102M 25L | C608 |
| CEA 470M 25L | C605 |
| CEA 470M 50L | C603 |
| CQMA 104K 50 | C611 |

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

| Part No. | Symbol & Description |
|--------------------------|-----------------------|
| RD ¹ PM 000 J | R601, R602, R604—R607 |
| RD ¹ PS 331J | R603 |

SEMICONDUCTORS

| Part No. | Symbol & Description |
|----------|----------------------|
| 2SD836A | Q20 |
| 2SC1384 | Q21 |
| 1S2076 | D29—D32 |
| (1S2473) | |
| (1S1555) | |
| KZL072 | D33 |
| KZL140 | D34 |
| 10E2 | D35, D36, D38—D41 |
| MZ-270 | D37 |
| KZL083 | D42 |

SWITCHES AND OTHER

| Part No. | Symbol & Description |
|--------------|----------------------|
| ASK-179 | S1 Lever switch |
| VBZ30P060FMC | Screw |

9.3 PARTS LIST

NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

| | | | |
|------|----------------------|---------------|-------------|
| 560Ω | 56 × 10 ¹ | 561 | RD1/PS 561J |
| 47kΩ | 47 × 10 ³ | 473 | RD1/PS 473J |
| 0.5Ω | 0R5 | | RN2H 0R5K |
| 1Ω | 010 | | RSIP 010K |

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

| | | | |
|--------|-----------------------|----------------|---------------|
| 5.62kΩ | 562 × 10 ³ | 5621 | RN1/4SR 5621F |
|--------|-----------------------|----------------|---------------|

- The  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

Miscellaneous Parts

P.C. BOARD ASSEMBLIES

| Part No. | Symbol & Description |
|----------|----------------------|
| GWE-137 | Tuner assembly |
| GWS-242 | Switch assembly (A) |
| GWS-241 | Switch assembly (B) |
| GWX-503 | Fuse assembly |
| GWX-506 | FL assembly |

OTHERS

| Part No. | Symbol & Description |
|-----------|------------------------|
| ▲ AEK-402 | FU1 Fuse T1A |
| ▲ ADG-039 | |
| ▲ ATT-708 | T101 AC power cord |
| AKP-016 | |
| ATB-627 | |
| ADE-033 | |
| | Power transformer |
| | Coaxial socket |
| | Bar-antenna assembly |
| | Connection cord |

TUNER ASSEMBLY (GWE-137)

Parts List

TRANSFORMERS, COILS

| Part No. | Symbol & Description |
|----------|--------------------------------|
| ATC-112 | T1 FM antenna coil |
| ATC-121 | T2 FM high frequency coil |
| ATC-115 | T3 FM OSC coil |
| ATE-039 | T4 FM IFT |
| ATE-043 | T5 FM DET. transformer |
| ATB-067 | T7 AM OSC coil |
| ATB-070 | T8 AM DET. transformer |
| ATF-053 | F1, F2 FM ceramic filter |
| ATF-108 | F3 AM ceramic filter |
| ATF-089 | F4, F5 Low pass filter |
| T24-028 | L1 RF coil |

CAPACITORS

| Part No. | Symbol & Description |
|---------------|---|
| ACM-008 | TC1, TC2, TC5 Film trimer |
| ACM-006 | TC3 Ceramic trimer |
| ACM-010 | TC7 Film trimer capacitor |
| CCDRH 080D 50 | C1, C4, C13 |
| CGB R47K 500 | C10 |
| CCDCH 020C 50 | C7, C17 |
| CCDCH 100D 50 | C317 |
| CCDCH 150J 50 | C16 |
| CCDCH 220J 50 | C24 |
| CCDCH 330J 50 | C14 |
| CCDPH 120J 50 | C11 |
| CCDTH 120J 50 | C304 |
| CCDSL 101J 50 | C6, C106, C502, C503 |
| CCDYB 102K 50 | C18 |
| CKDYB 221K 50 | C313 |
| CKDYB 472K 50 | C401 |
| CKDYB 682K 50 | C407 |
| CKDYF 103Z 50 | C2, C3, C5, C8, C9, C12, C15, C20-C22, C27-C30, C107, C113, C114, C305-C307, C309, C318, C321, C510, C511 |

| | |
|---------------|---|
| CKDYF 223Z 50 | C101, C102, C105, C311, C315, C402-C405, C513, C508, C509 |
| CKDYF 473Z 50 | C104, C112, C316, C409-C111, C103 |
| CKDYX 473M 25 | C201 |
| CQMA 332J 50 | C203, C204 |
| CQMA 683K 50 | C310 |
| CQSH 431K 50 | C302 |
| CEA 010M 50L | C211-C213, C207, C208, C109, C323 |
| CEA 100M 50L | C210, C308, C411, C506, C512, C505 |
| CEA 101M 10L | C19, C23, C202, C501 |

| Part No. | Symbol & Description |
|----------|----------------------|
|----------|----------------------|

| | |
|--------------|-----------------------------|
| CEA 101M 25L | C26, C215 |
| CEA 2R2M 50L | C25, C205, C206, C408, C412 |
| CEA 220M 25L | C209, C319 |
| CEA 330M 16L | C504 |
| CEA 470M 10L | C110, C314 |
| CEA 4R7M 50L | C807 |
| CEA 472M 10L | C406 |
| ACG-018 | C214 Ceramic capacitor |

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

| Part No. | Symbol & Description |
|----------|----------------------|
|----------|----------------------|

| | |
|----------------|--|
| RD1/PM 000 J | R1—R24, R101—R118, R201—R218, R220, R301—R315, R401—R431, R433, R501—R507, R509—R532 |
| RN1/4PQ 0000 F | R219 |
| ACN-120 | R432 Ladder resistor |
| ACP-078 | VR1, VR2 Semi-fixed (2.2k) |
| C92-049 | VR3 Semi-fixed (10k) |
| ACP-086 | VR4 Semi-fixed (22k) |

SEMICONDUCTORS

| Part No. | Symbol & Description |
|----------|----------------------|
|----------|----------------------|

| | |
|---------------|---|
| 2SK61-Y | Q1 |
| 2SC535 | Q2 |
| 2SC461 | Q3, Q10, Q11 |
| 2SK168 | Q4, Q8 |
| HA1201 | Q5 |
| 2SA733A | Q6, Q15, Q17 |
| PA3001-A | Q7 |
| HA1138 | Q9 |
| μ PC4558C | Q12 |
| (NJM4558DV) | |
| LC7207 | Q13 |
| PA4006-A | Q14 |
| 2SC945A | Q16, Q27 |
| 2SC1384 | Q18 |
| μ PD4011C | Q19 |
| (MB84011M) | |
| M54459L | Q26 |
| 1SV68-08 | D1, D2, D5 |
| KZL061 | D3 |
| 1S2076 | D4, D7, D8, D12—D15, D19—D26, D28, D60, D61, D63, D64 |
| (1S2473) | |
| (1S1555) | |
| MZ-047 | D6 |
| KV1226-Y | D10 |
| KZL-083 | D27, D65 |

SWITCHES AND OTHER

| Part No. | Symbol & Description |
|----------|----------------------|
| ASK-174 | S2 Lever switch |
| ASK-172 | S3 Lever switch |
| AKA-016 | Terminal (ANTENNA) |

SWITCH ASSEMBLY A (GWS-242)
Parts List
CAPACITORS

| Part No. | Symbol & Description |
|--------------|------------------------|
| CEA 101M 25L | C601, C602, C609, C610 |
| CEA 101M 10L | C606, C607 |
| CEA 101M 35L | C604 |
| CEA 102M 25L | C608 |
| CEA 470M 25L | C605 |
| CEA 470M 50L | C603 |
| CQMA 104K 50 | C611 |

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

| Part No. | Symbol & Description |
|--------------|-----------------------|
| RD1/PM 000 J | R601, R602, R604—R607 |
| RD1/PS 331J | R603 |

SEMICONDUCTORS

| Part No. | Symbol & Description |
|----------|----------------------|
| 2SD836A | Q20 |
| 2SC1384 | Q21 |
| 1S2076 | D29—D32 |
| (1S2473) | |
| (1S1555) | |
| KZL072 | D33 |
| KZL140 | D34 |
| 10E2 | D35, D36, D38—D41 |
| MZ-270 | D37 |
| KZL083 | D42 |

SWITCHES AND OTHER

| Part No. | Symbol & Description |
|--------------|----------------------|
| ASK-179 | S1 Lever switch |
| VBZ30P060FMC | Screw |

SWITCH ASSEMBLY B (GWS-241)

Parts List

RESISTORS AND SWITCHES

| Part No. | Symbol & Description |
|--------------------------|--------------------------------------|
| RD1/4PM □□□ J ASG-163 | R701-R705 S5, S6 Tact switch |
| | |

SEMICONDUCTORS

| Part No. | Symbol & Description |
|--------------------------------|----------------------|
| 2SC945A | Q22, Q23 |
| AEL-343 | D43, D44 LED |
| 1S2076 (1S2473) (1S1555) | D45 |
| | |

FL ASSEMBLY (GWX-506)

Parts List

CAPACITORS

| Part No. | Symbol & Description |
|---------------|----------------------|
| CEB 100P 16 | C801 |
| CEB 010P 50 | C802 |
| CKDYX 473M 25 | C803, C804 |
| CCDCH 270J 50 | C805, C806 |

Note: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

RESISTORS

| Part No. | Symbol & Description |
|---------------|--------------------------------|
| ACP-036 | VR5, VR6 Semi-fixed (10k) |
| RD1/4PM 560J | R811 |
| RD1/4PM □□□ J | R801-R810, R812-R831 |
| | |

SEMICONDUCTORS

| Part No. | Symbol & Description |
|--------------------------------|---------------------------|
| LB1416 | Q24 |
| LC7258 | Q25 |
| AEL-343 | D47-D53 LED |
| AEL-337 | D54-D58 LED |
| 1S2076 (1S2473) (1S1555) | D59 |
| | |
| AEL-334 | D46 LED (STEREO IND) |

SWITCHES AND OTHERS

| Part No. | Symbol & Description |
|--------------|------------------------------------|
| ASG-163 | S7-S14 Tact switch |
| ASS-013 | X1 Crystal resonator |
| AAV-012 | V1 Fluorescent indicator tube |
| VBZ30P100FZK | Screw |
| ABE-061 | Washer |